

1 CLAIMS

2 We claim:

3 1. A method for provisioning in a computing utility infrastructure, the method comprising:

4 obtaining a Concrete Resource Model describing a desired resource structure; and

5 using the Concrete Resource Model to generate at least one provisioning action to create a
6 matching resource structure in the computing utility infrastructure.

7 2. A method as recited in claim 1, wherein the step of using the Concrete Resource Model
8 includes executing at least one phase comprised of a matching step and a configuring step,
9 wherein the steps of matching and configuring are repeated until the Concrete Resource Model is
10 entirely matched with a set of at least one Resource Instance Service in said knowledge
11 subsystem.

12 3. A method as recited in claim 2, wherein the step of matching includes mapping every node in a
13 subset of nodes in the Concrete Resource Model to a Resource Instance Service in the knowledge
14 subsystem, such that for every node in said subset, constraints on values of fixed attributes in
15 said node are satisfied by the values of the same attributes in the corresponding Resource
16 Instance Service, and the set of fixed relationships between matched nodes matches the set of
17 relationships between the corresponding Resource Instance Services.

18 4. A method as recited in claim 2, wherein the step of configuring includes:

19 collecting provisioning actions to a provisioning action set;

20 selecting a provisioning action having all preconditions satisfied;

1 executing the provisioning action, and updating the knowledge subsystem with side effects of the
2 provisioning action; and

3 repeating the steps of selecting and executing until all provisioning actions whose preconditions
4 are satisfied are executed.

5 5. A method as recited in claim 2, wherein the step of configuring includes selecting a
6 provisioning action from a provisioning action set having at least one precondition not satisfied,

7 finding a different action to satisfy said at least one precondition; and

8 adding said different action to said provisioning action set

9 6. A method as recited in claim 4, further comprising obtaining said side effects of an action by
10 at least one of:

11 inspecting the definition of said provisioning action in said knowledge subsystem; and

12 dynamically discovering the side effects once the action is executed by executing a discovery
13 component.

14 7. A method as recited in claim 1, wherein the step of provisioning includes at least one task
15 taken from a group of tasks consisting of:

16 creating a new service environment;

17 changing a combination of resources allocated to the service environment;

18 changing the configuration of resources allocated to a service environment; and

1 destroying a service environment ; and

2 any combination of these tasks.

3 8. A method as recited in claim 7, wherein changing the configuration of resources allocated to a
4 service environment includes at least one of:

5 changing a local state of a resource; and

6 changing a way the resource is configured to work with other resources.

7 9. A method as recited in claim 1, further comprising regenerating provisioning instructions
8 whenever at least one of the following occurs:

9 infrastructure characteristics change; and

10 requirements of the service change; and

11 Provider's policy change.

12 10. A method as recited in claim 9, wherein infrastructure characteristics are taken from a group
13 of characteristics consisting of:

14 types of resources in the infrastructure;

15 capabilities of said resources;

16 configuration of said resources;

1 constraints on a configuration of said resources; and

2 any combination of these characteristics.

3 11. A method as recited in claim 1, further comprising employing said Concrete Resource Model
4 to generate a Resource Manager for a composite resource.

5 12. A method as recited in claim 1, wherein said Resource Manager provides a set of resource
6 manager methods taken from a group of resource manager methods consisting of:

7 creating composite resources based on a Concrete Resource Model;

8 changing composite resources based on a Concrete Resource Model;

9 destroying composite resources based on a Concrete Resource Model; and

10 any combination of these resource manager methods.

11 13. A method as recited in claim 1, wherein the step of using is executed according to an
12 execution specification.

13 14. A method as recited in claim 1, wherein said execution specification is taken from a group of
14 execution specifications consisting of:

15 execute immediately;

16 stored and executed later at least once; and

17 a combination of the above.

1 15. An article of manufacture comprising a computer usable medium having computer readable
2 program code means embodied therein for causing provisioning in a computing utility
3 infrastructure, the computer readable program code means in said article of manufacture
4 comprising computer readable program code means for causing a computer to effect the steps of
5 claim 1.

6 16. A program storage device readable by machine, tangibly embodying a program of
7 instructions executable by the machine to perform method steps for provisioning in a computing
8 utility infrastructure, said method steps comprising the steps of claim 1.

9 17. An apparatus for provisioning in a computing utility infrastructure, the apparatus
10 comprising:

11 means for obtaining a Concrete Resource Model describing a desired resource structure; and

12 means for using the Concrete Resource Model to generate at least one provisioning action to
13 create a matching resource structure in the computing utility infrastructure.

14 18. A computer program product comprising a computer usable medium having computer
15 readable program code means embodied therein for causing provisioning in a computing utility
16 infrastructure, the computer readable program code means in said computer program product
17 comprising computer readable program code means for causing a computer to effect the
18 functions of claim 17.

19 19. A method as recited in claim 2, wherein said at least one phase is a Concrete Model
20 Processing Engine phase, the Concrete Model Processing Engine:

21 receiving requests in the form of a Concrete Resource Model describing a desired resource
22 structure; and

1 generating provisioning actions for reaching a state that satisfies the requirements specified in the
2 Concrete Resource Model.

3 20. A method as recited in claim 1, wherein the steps of obtaining and using are performed by at
4 least one user taken from a group of users consisting of:

5 a service provider;

6 an enterprise owning an infrastructure used for running at least one application;

7 a customer of a service provider;

8 a company owning an IT infrastructure; and

9 a utility provider.

10 21. A method as recited in claim 20, wherein at least one of said at least one user provides
11 operational constraints dictating acceptable variations.